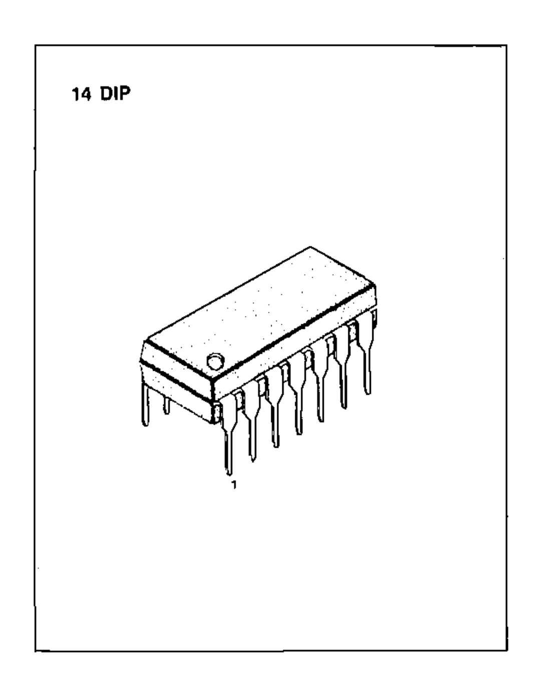
DUAL EQUALIZER AMPLIFIER WITH ALC

The KA2224 is a monolithic integrated circuit consisting of a dual equalizer amplifier with ALC, and it is suitable for stereo radio cassettes.

FEATURES

- Dual equalizer amplifier with a built-in ALC circuit.
- **Recording amp available because of high gain characteristic (Variable monitor possible).**
- **Good channel separation (CS = 50dB Typ).**
- **Quick stabilization after power on.**
- **Capable of direct meter driving and ALC transistor.**
- **Good ALC response balance between channels.**
- **Wide operating supply voltage range: V_{CC} = 4V ~ 13V**



ORDERING INFORMATION

Device	Package	Operating Temperature
KA2224	14 DIP	−20°C ~ +70°C

BLOCK DIAGRAM

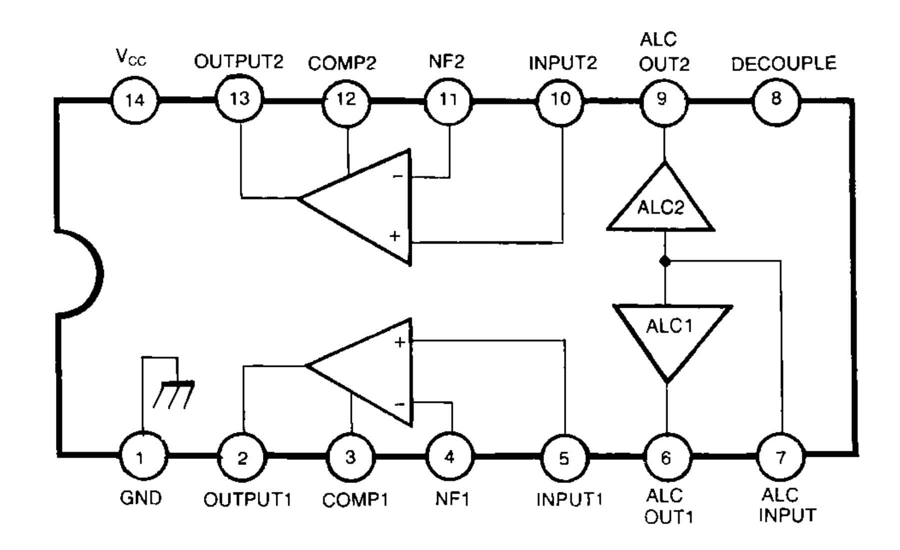


Fig. 1

ABSOLUTE MAXIMUM RATINGS (T_a=25°C)

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{CC}	14	V
Power Dissipation	P_D	600	mW
Operating Temperature	T_{OPR}	−20 ~ +70	°C
Storage Temperature	T_{STG}	−40 ~ +125	°C
ALC TR Maximum Current		3.5	mA

ELECTRICAL CHARACTERISTICS

(T_a=25°C, V_{CC}=5V, R_L=10KΩ, f=1KHz: play, R_L=680Ω: Recording)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Quiescent Circuit Current	I_{CCQ}	V_I=0		4.5	10	mA
Open Loop Voltage Gain	G_{VO}			85		dB
Closed Loop Voltage Gain	G_{VC1}	Play		40		dB
	G_{VC2}	Record		58		dB
Output Voltage	V_O	THD=1%, Play	0.9	1.2		V
Total Harmonic Distortion	THD	V_O=0.5V, Play		0.1	1.0	%
Input Resistance	R_I		21	30		KΩ
Equivalent Input Noise Voltage	V_{NI}	BW (−3dB) =20Hz ~ 20KHz		1.0	2.0	μV
Cross Talk	CT	R_G=2.2KΩ	40	50		dB
ALC Range	ΔV_{ALC}	V_I= −60dBm, Record	35	45		dB
ALC Balance	CB_{ALC}	V_I= −20dBm, Record		0	2.0	dB
ALC Distortion	THD_{ALC}	V_I= −20dBm, Record		0.5	2.0	%

TEST CIRCUIT

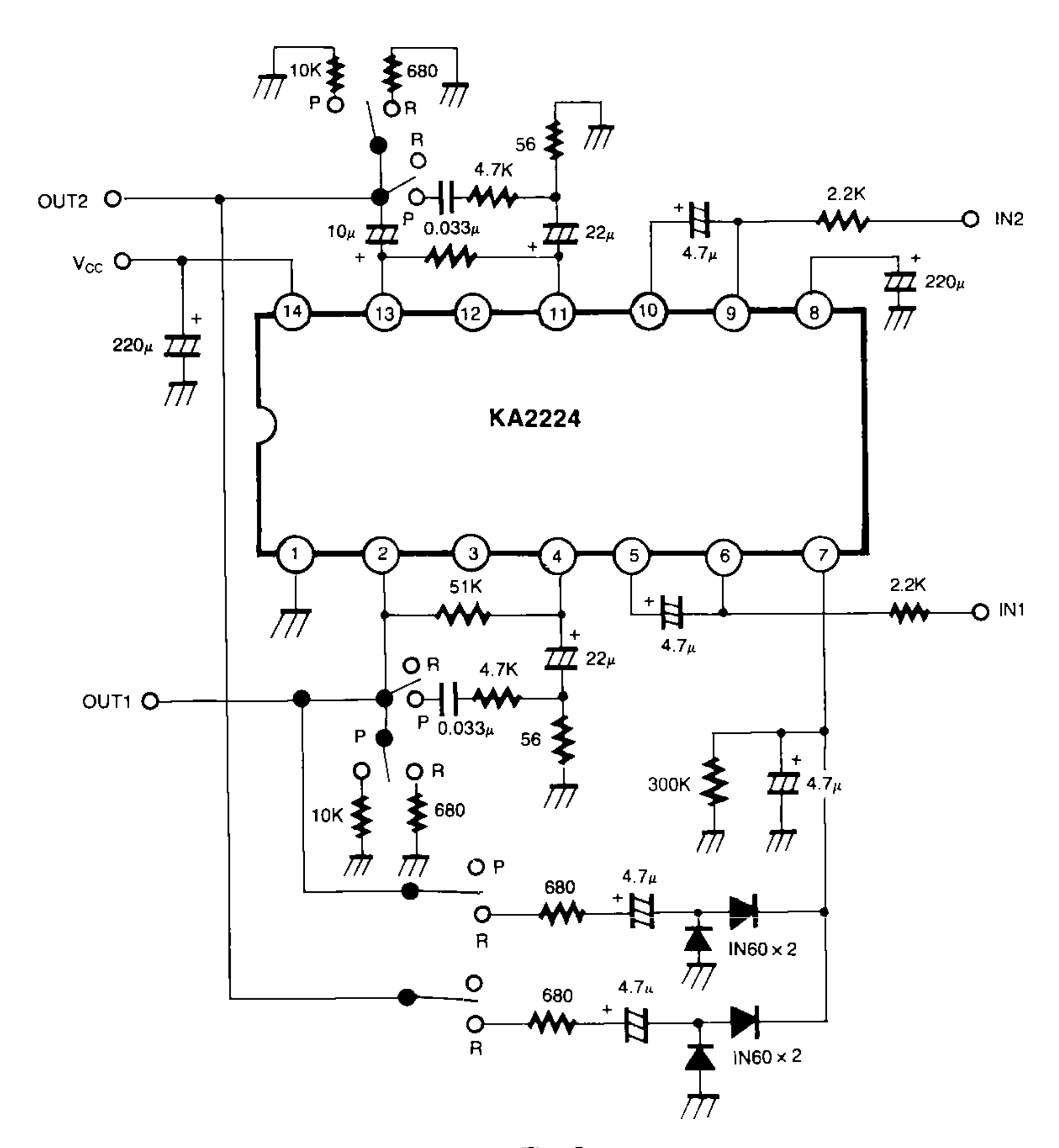
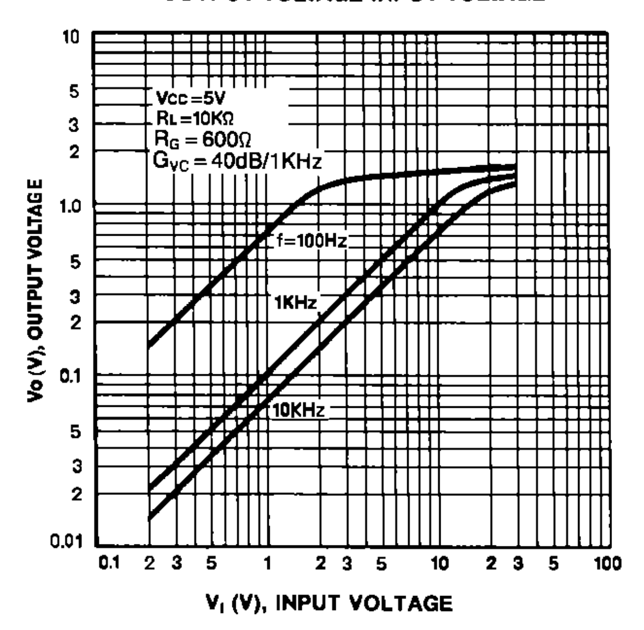
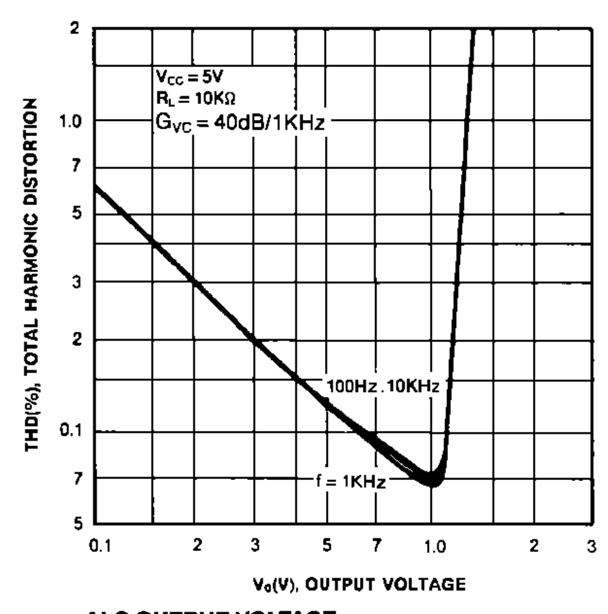


Fig. 2

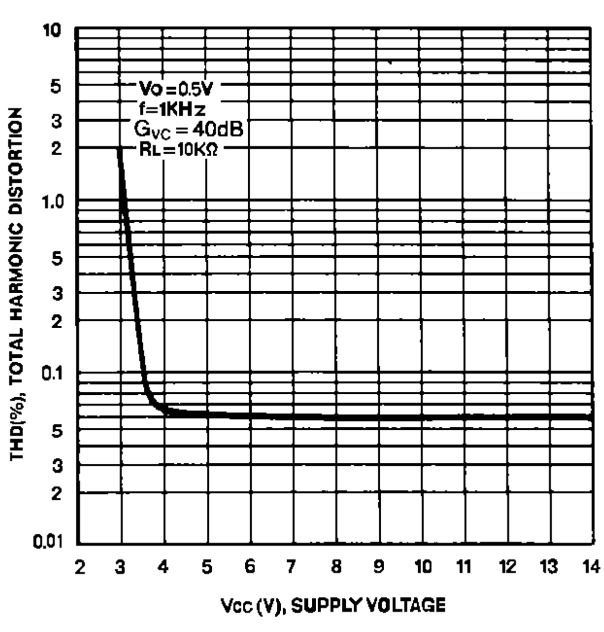
OUTPUT VOLTAGE-INPUT VOLTAGE



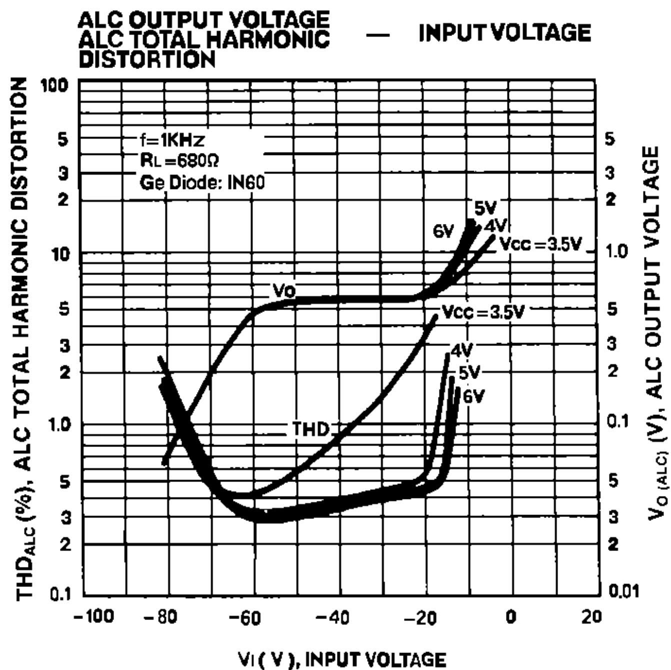
TOTAL HARMONIC DISTORTION-OUTPUT VOLTAGE



TOTAL HARMONIC DISTORTION-SUPPLY VOLTAGE

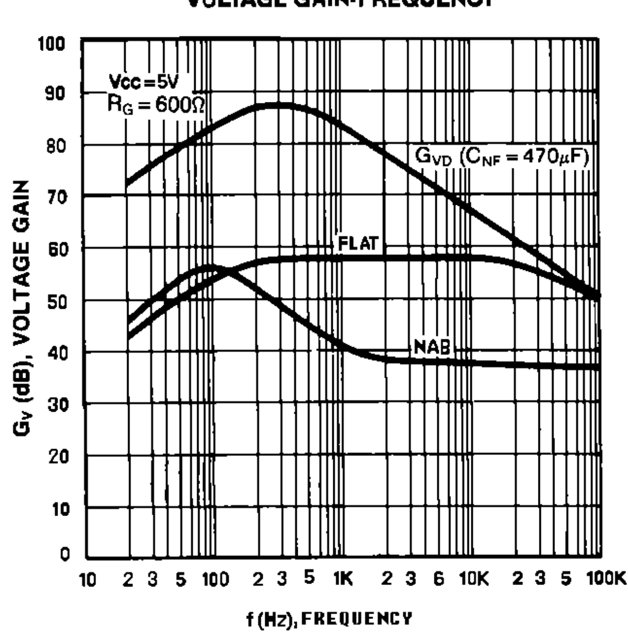


ALC OUTPUT VOLTAGE / ALC TOTAL HARMONIC DISTORTION — INPUT VOLTAGE

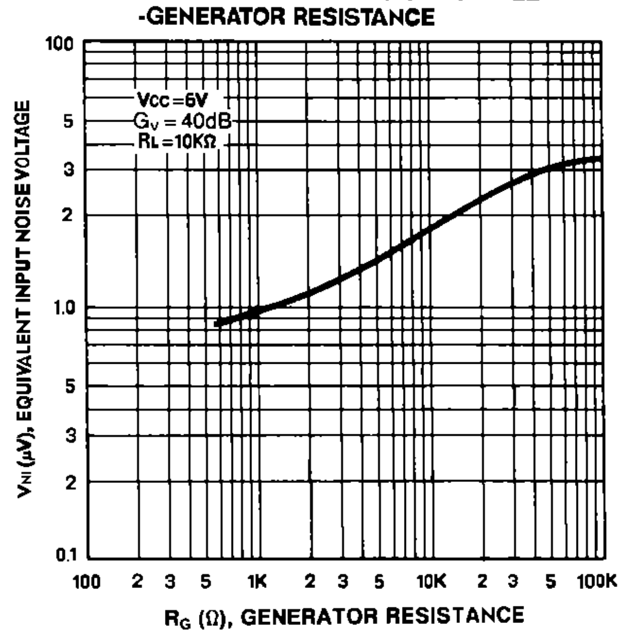


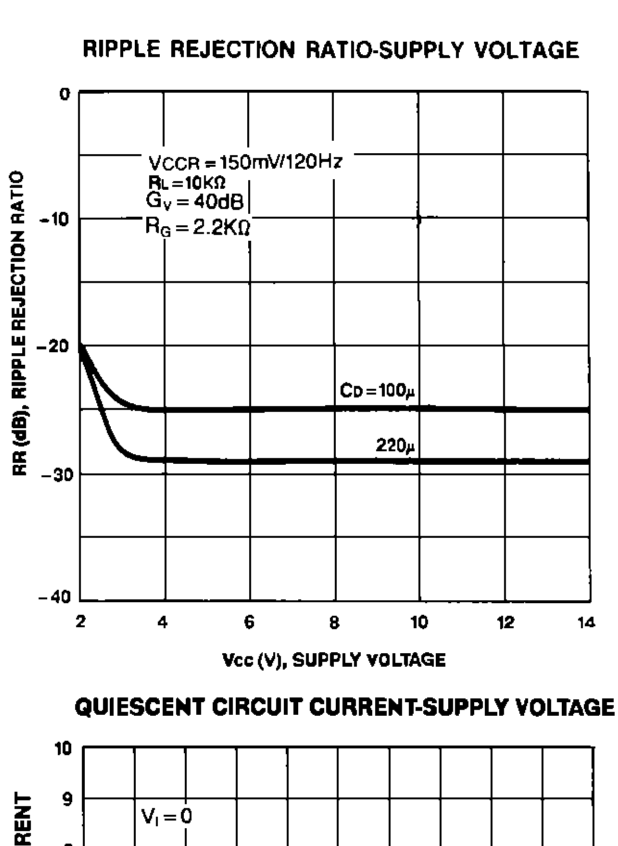


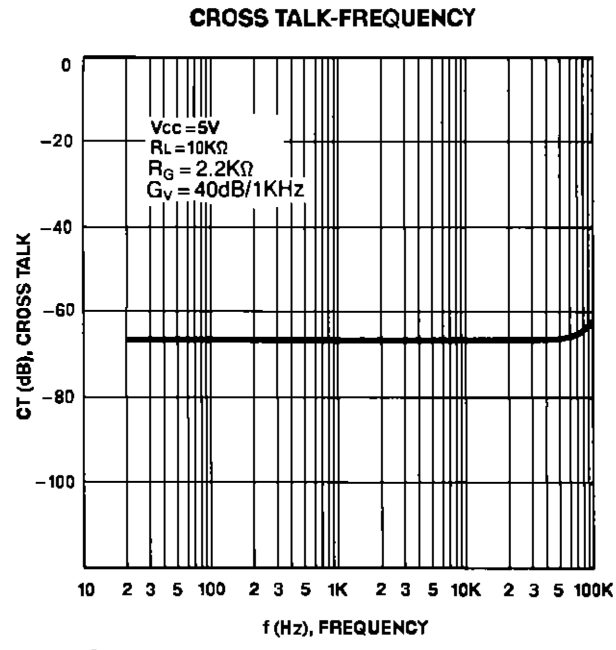
VOLTAGE GAIN-FREQUENCY

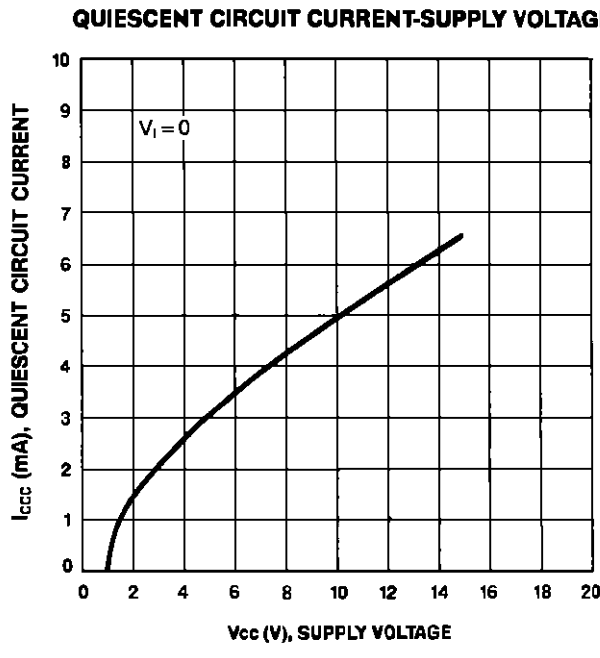


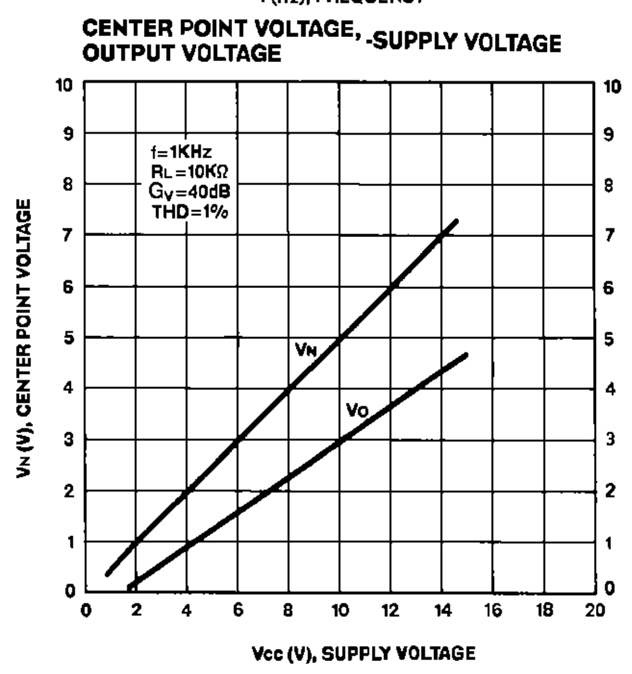
EQUIVALENT INPUT NOISE VOLTAGE -GENERATOR RESISTANCE

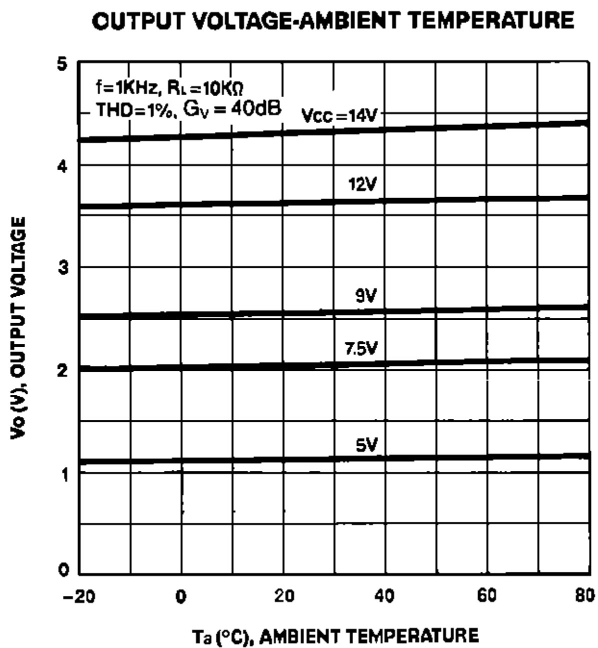


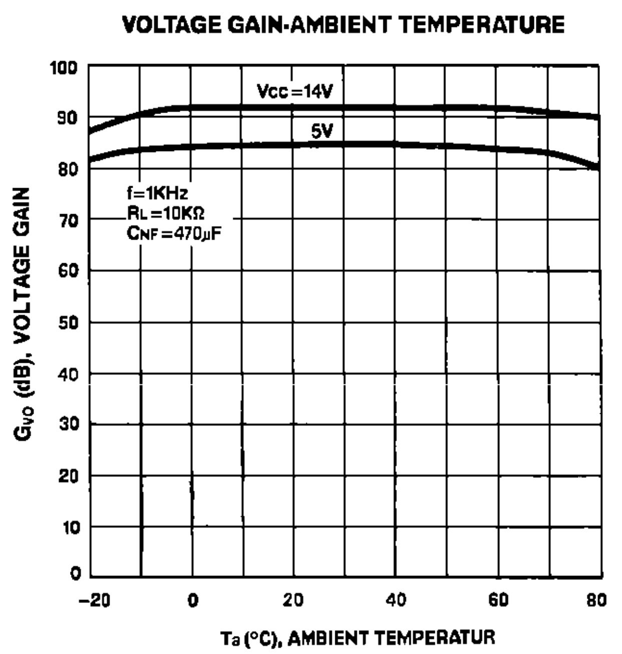

RIPPLE REJECTION RATIO-SUPPLY VOLTAGE
VCCR = 150mV/120Hz
RL = 10KΩ
GV = 40dB
RG = 2.2KΩ
CD = 100μ
220μ
RR (dB), RIPPLE REJECTION RATIO
Vcc (V), SUPPLY VOLTAGE


CROSS TALK-FREQUENCY
Vcc = 5V
RL = 10KΩ
RG = 2.2KΩ
GV = 40dB/1KHz
CT (dB), CROSS TALK
f (Hz), FREQUENCY


QUIESCENT CIRCUIT CURRENT-SUPPLY VOLTAGE
VI = 0
ICCC (mA), QUIESCENT CIRCUIT CURRENT
Vcc (V), SUPPLY VOLTAGE


CENTER POINT VOLTAGE, OUTPUT VOLTAGE -SUPPLY VOLTAGE
f = 1KHz
RL = 10KΩ
GV = 40dB
THD = 1%
VN
VO
VN (V), CENTER POINT VOLTAGE
VO (V), OUTPUT VOLTAGE
Vcc (V), SUPPLY VOLTAGE


OUTPUT VOLTAGE-AMBIENT TEMPERATURE
f = 1KHz, RL = 10KΩ
THD = 1%, GV = 40dB
Vcc = 14V
12V
9V
7.5V
5V
VO (V), OUTPUT VOLTAGE
Ta (°C), AMBIENT TEMPERATURE


VOLTAGE GAIN-AMBIENT TEMPERATURE
Vcc = 14V
5V
f = 1KHz
RL = 10KΩ
CNF = 470μF
GVO (dB), VOLTAGE GAIN
Ta (°C), AMBIENT TEMPERATUR

APPLICATION INFORMATION

1. Closed Loop Voltage Gain

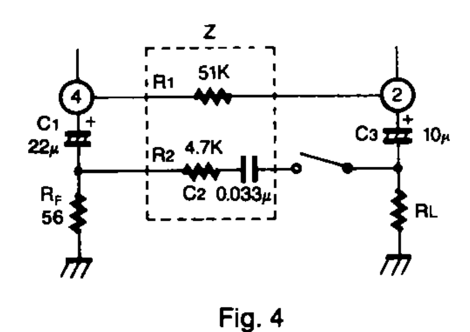


Fig. 4

SW on: play
off: record

A. Playback amplifier

$$G_V = 20 \log \frac{Z}{R_F} \text{ (dB) at } f = 1\text{KHz},\ G_V = 42\text{dB (Typ)}\quad Z = R_1 // (R_2 + \frac{1}{2\pi f \cdot C_2})$$

B. Recording amplifier

$$G_V = 20 \log \frac{R_1}{R_F} \text{ (dB) at } f = 1\text{KHz},\ G_V = 58\text{dB (Typ)}$$

2. ALC Circuit

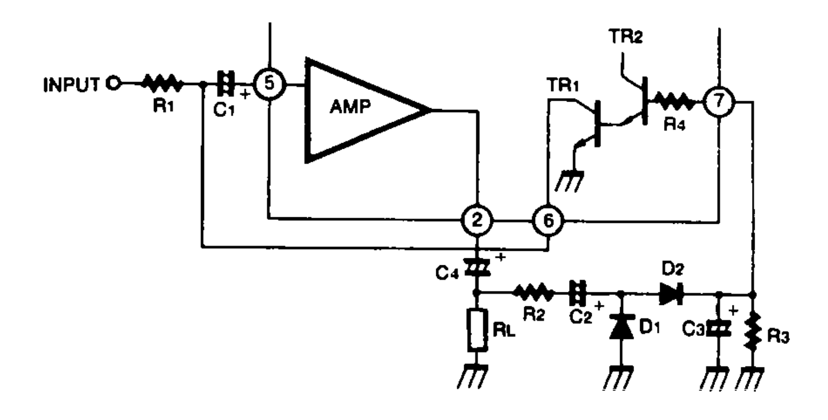


Fig. 5

The ALC circuit is consist of TR_1, TR_2 and some external components. The output level of the amplifier is rectified by external circuits. Since this DC level is applied to the ALC input terminal (Pin 7), the impedance between the collector and emitter of TR1 can change its value, therefore the pre-amplifier input level can be controlled.